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(54) **Golf ball for miniature golf links**

(57) A golf ball (70,76) for miniature golf links is formed of a three layer structure; a surface part (70a, 76a), intermediate part (70b,76b) and core (70c,76c). The surface part (70a,76a) is made of the same composite of rubber and filler as a formal golf ball. The intermediate part (70b,76b) is made of a softer material than the surface part (70a,76a). The core (70c,76c) may be solid or hollow. Various types of concave or convex structures may be formed on the surface of the ball.

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Field of the Invention

The present invention relates to miniature golf links, more specifically to miniature golf links used for enjoying playing golf in an area smaller than formal golf links.

golf links, that is, a poor profitability. This has caused the necessity of a 18-hole course for a 18-hole game, requiring a large tract of land of about 594,000 m² and a large amount of expense for constructing formal golf links. This is the reason for the deficiency of golf links, exceedingly high charge for a game, and a long queue of players, etc., and has long prevented a nice sport golf from being popular among public people. Besides, some golf links have recently caused the problem of water pollution by applying harmful agricultural chemicals on the large area of their grass links, developing a severe social problem of polluting adjacent river and underground water as well as the links themselves. They used agricultural chemicals to protect their large grass links against diseases and bad insects with no alternative means.

Summary of the Present Invention

The principal object of the present invention is to provide a golf ball for miniature golf links for enjoy playing golf in links smaller than formal golf links.

Another object is to provide miniature golf links for playing a pseudo-formal-golf game with a golf ball of smaller flight distance in an area smaller than formal golf links.

All objects of the present invention are clearly shown in the following figures:

Brief Description of the Drawings

Figure 45 is a side view of a golf ball appropriately used in miniature golf links applied with the present invention.

Figure 46 is a partial inner view for explaining the inner composition of the golf ball shown in Figure 45.

Figures 47 is a profile of the golf ball shown in Figure 46 along the line A-A.

Figure 48 is a profile of the golf ball shown in Figure 46 along the line B-B.

Figure 49 is a profile of a golf ball on a tee.

Figure 52 is a partial inner view of another golf ball.

Figure 53 is a partial inner view of another golf ball.

Figure 54 is a profile of the golf ball shown in Figure 53.

Figure 56 is a profile for explaining the relationship between a club and a ball when shot by a full

swing.

Figure 57 is a profile for explaining the relationship between a club and a padded ball.

Figure 58 is a front view of another golf ball.

Figure 59 is a profile of the golf ball shown in Figure 58.

Figure 60 is a partial inner view of the golf ball shown in Figure 58.

Figure 61 is a general view of a golf ball applied with the present invention.

Figure 62 is an enlarged front view of the dimples of the golf ball shown in Figure 61.

Figure 63 is an oblique view of the dimple shown in Figure 62.

Figure 64 is a general view of a golf ball of another embodiment applied with the present invention.

Figure 65 is an enlarged front view of the golf ball dimple shown in Figure 64.

Figure 66 is an oblique view of the dimple shown in Figure 65.

Figure 67 is an enlarged front view of another dimple.

Figure 68 is an oblique view of the dimple shown in Figure 67.

Figure 69 is a general view of another embodiment of a golf ball applied with the present invention.

Figure 70 is an enlarged front view of the dimple of the golf ball shown in Figure 69.

Figure 71 is an oblique view of the dimple of a golf ball shown in Figure 70.

Figure 72 is a general view of another embodiment of a golf ball applied with the present invention.

Figure 73 is an enlarged front view of the dimple of the golf ball shown in Figure 72.

Figure 74 is an oblique view of the dimple shown in Figure 73.

Figure 75 is a general view of another embodiment of a golf ball applied with the present invention.

Figure 76 is an enlarged front view of the golf ball shown in Figure 75.

Figure 77 is an oblique view of the dimple shown in Figure 76.

Figure 78 is a front view of another golf ball.

Figure 79 is a back view of the golf ball shown in Figure 78.

Figure 80 is a front view of the golf ball shown in Figure 78.

Figure 81 is a bottom view of the golf ball shown in Figure 78.

Figure 82 is a left side view of the golf ball shown in Figure 78.

Figure 83 is a right side view of the golf ball shown in Figure 78.

Figure 84 is a profile of the golf ball shown in Figure 78 along the line A-A.

Figure 85 is a front view of another golf ball.

Figure 86 is a back view of the golf ball shown in Figure 85.

Figure 87 is a plan view of the golf ball shown in Figure 85.

Figure 88 is a bottom view of the golf ball shown in Figure 85.

Figure 89 is a left side view of the golf ball shown in Figure 85.

Figure 90 is a right side view of the golf ball shown in Figure 85.

Figure 91 is a profile of the golf ball shown in Figure 85 along the line A-A.

Figure 92 is a front view of another golf ball.

Figure 93 is a back view of the golf ball shown in Figure 92.

Figure 94 is a plan view of the golf ball shown in Figure 92.

Figure 95 is a bottom view of the golf ball shown in Figure 92.

Figure 96 is a left side view of the golf ball shown in Figure 92.

Figure 97 is a right side view of the golf ball shown in Figure 92.

Figure 98 is a profile of the golf ball shown in Figure 92 along the line A-A.

Figure 99 is a front view of another golf ball.

Figure 100 is a back view of the golf ball shown in Figure 99.

Figure 101 is a front view of the golf ball shown in Figure 99.

Figure 102 is a bottom view of the golf ball shown in Figure 99.

Figure 103 is a left side view of the golf ball shown in Figure 99.

Figure 104 is a right side view of the golf ball shown in Figure 99.

Figure 105 is a profile of the golf ball shown in Figure 99 along the line A-A.

Figure 106 is a partial plan view of another golf ball.

Figure 107 is a profile of the golf ball shown in Figure 106 along the line A-A.

Figure 108 is a partial plan view of another golf ball.

Figure 109 is a profile of the golf ball shown in Figure 108 along the line A-A.

Figure 110 is a partial plan view of another golf ball.

Figure 111 is a profile of the golf ball shown in Figure 110 along the line A-A.

Figure 112 is a partial plan view of another golf ball.

Figure 113 is a profile of the golf ball shown in Figure 112 along the line A-A.

Figure 114 is a front view of another embodiment of a golf ball applied with the present invention.

Figure 115 is a plan view of the golf ball shown in Figure 114.

Figure 116 is a front view of another golf ball.

Figure 117 is a plan view of the golf ball shown in Figure 116.

Figure 118 is a plan view of another golf ball.

Figure 119 is a plan view of the golf ball shown in Figure 118.

Figure 120 is a plan view of another golf ball.

Figure 121 is a plan view of the golf ball shown in Figure 120.

Figure 122 is a front view of another golf ball.

Figure 123 is a plan view of the golf ball shown in Figure 122.

Figure 124 is a plan view of another golf ball.

Figure 125 is a plan view of the golf ball shown in Figure 124.

Figure 126 is a plan view of another golf ball.

Figure 127 is a plan view of the golf ball shown in Figure 126.

Figure 128 is a front view of another golf ball.

Figure 129 is a plan view of the golf ball shown in Figure 128.

Figure 130 is a front view of another golf ball.

Figure 131 is a plan view of the golf ball shown in Figure 130.

Figure 132 is a front view of another golf ball.

Figure 133 is a plan view of the golf ball shown in Figure 132.

Description of the Preferred Embodiments

Figures 45 through 49 show a golf ball of half flight distance (about 100 m) of a formal golf ball by a full swing with an ordinary golf club such as a driver, etc. The ball is made in equal diameter and weight to a formal golf ball, divided into 3 layers and made gradually softer to an inner layer. The approaching and putting steps can be performed similarly to the formal golf ball. A golf ball 70 shown in Figure 46 is designed in the ordinary range of 41.15 - 41.67 mm in diameter, and the weight 44.50 - 45.92 also in the ordinary range. It is divided into three parts: a surface part 70a, intermediate part 70b, and core 70c. The surface part 70a is made of the same material as a formal golf ball including rubber and filler, the intermediate part 70b is made of a material of larger gravity and softer property, and the core is formed hollow.

To obtain the same reaction from this ball as the formal ball at the approaching and putting steps, the weight of the surface part 70a must be the total weight of the intermediate part 70b and the core 70c. Therefore, the gravity of the composite of the intermediate part 70b must be much

larger than the surface part 70b because the core is hollow and zero in gravity.

Additionally, as the golf ball 70 is set in the range of the diameter and weight of a formal golf ball, and made hollow at the core 70c, the whole weight is concentrated to the surface part 70a and the intermediate part 70b. Therefore, the weight is the same as a formal golf ball, but the moment of inertia is larger.

A golf ball 70 has a tee hole 70d in the surface part 70a and the intermediate part 70b in the diameter direction. As shown in Figure 49, the ball is placed on a tee 72 set up on the grass 71 with the top tip of the tee set into the tee hole 70d. The desirable tee hole 70d is 4 - 8 mm in depth and 3 - 5 mm in diameter. As a golf ball can be set stable on a tee by inserting a top tip 72a of a tee into the tee hole 70d of the ball, the configuration of the tee hole 70d and the top tip 72a can be applied to the golf ball of normal flight distance.

The surface part 70a of the above mentioned golf ball is made of the same composite as a formal solid golf ball comprising rubber and filler, and the intermediate part 70b of softer and larger gravity composite than the surface part composite. Therefore, the ball is gradually softer from the surface part 70a through the intermediate part 70b to the core 70c. With this property, the ball 73 cannot absorb the impact only in the surface part 70a when shot by a golf club 73 as shown in Figure 50, but is affected up to the intermediate part 70b and the core 70c, thereby deforming the ball much more than the formal golf ball to absorb the impact by a full swing, reducing the ball speed down to half.

The golf ball shown in Figure 46 is formed hollow at the core, while Figure 52 shows an embodiment indicating a non-hollow ball at the core. In this figure, a golf ball 76 has a diameter and weight of a formal golf ball in the range from 41.15 mm to 42.67 mm and from 44.50 g to 45.92 g, and divided into 3 parts: a surface part 76a, an intermediate part 76b, and a core 76c. The surface part 76a of the above mentioned golf ball is made of the same composite as a formal golf ball comprising rubber and filler, and the intermediate part 76b of softer and smaller gravity composite than the surface part 76a composite. The core 76c comprises a harder and larger gravity composite than the composite of the surface part 76a such as iron, lead, etc.

The golf ball above has half flight distance of a formal golf ball when shot by a full swing as the ball shown in Figures 46.

As the above golf ball has the equal diameter and weight to a formal golf ball, its average gravity is above 1. Therefore, it will sink in water like a formal golf ball when shot into a pond, judged as a

lost ball, causing the trouble of taking it out of water both on the parts of players' and golf link managements. Additionally, as this kind of balls are used in golf links having smaller and shallower ponds, lost balls are easily seen sunk in water, ruining the views of the links.

Figures 53 and 54 show an embodiment of a golf ball designed to float on water.

In these figures a golf ball 77 is a sphere having a diameter of a formal golf ball in the range of from 41.15 mm to 42.67 mm. The sphere is divided into three parts: a surface part 77a, an intermediate part 77b, and a core 77c. The surface part 77a is made of the same composite as a formal golf ball comprising rubber and filler, the intermediate part 77b of a softer and smaller gravity composite than the surface part 77a (for example, foam object, foam polyethylene, foam polyurethane, etc.). The core 77c is made of a softer and smaller gravity composite than the intermediate part 77b. Therefore, the golf ball 77 is designed to be gradually softer and lighter to the inner part. The average gravity of the golf ball 77 is less than 1.0, that is, the ball 77 is set to 30 - 36 g to float on water.

As the golf ball 77 described above is gradually softer and lighter to the inner part, the impact given to the ball by a full swing reaches the core 77c and absorbs the impact more gently than a formal golf ball, shortening the flight distance of the ball 77. However, a smaller impact by a putter, etc. is absorbed at the surface part 77a, and the ball 77 can be carried with the touch to a formal golf ball.

As shown in Figure 56, when the golf ball 77 is shot by a full swing of a golf club as indicated by the arrow A, the impact cannot be absorbed only at the surface part 77a, but reaches the intermediate part 77b and the core 77c, thereby deforming the golf ball 77 much more than a formal golf ball to absorb the impact by a full swing and reducing the initial ball speed down to a half of a formal golf ball.

When the ball 77 is shot by an iron No. 9, for example, the impact is not so large that most of the impact can be absorbed at the surface part 77a and the intermediate part 77b, carrying the ball with the touch of pitching a formal golf ball.

As shown in Figure 57, when the golf ball 77 is put by a putter as indicated by the arrow B on a putting green (not shown in the figure), the impact is further smaller than by pitching, and it is completely absorbed at the surface part 77a. As a result, the ball 77 can be put with the touch to a formal golf ball.

As the golf ball 77 has the average gravity less than 1, the ball floats on water W as shown in Figure 55 when it is shot into the water W of a pond 80, and can be easily taken out of the pond

80 by only waiting for the ball coming ashore on the wind or by catching it with a pole or something. Therefore, neither players nor golf link managements have the trouble of taking out a mass of the golf balls 77 sunk at the bottom of ponds 80. Thanks to this property of the golf ball 77, the loss from lost balls and from ruining the views of the golf links can be eliminated.

The golf ball shown in Figures 58 through 60 is designed to have a shorter flight distance by providing a narrow hole in the ball. In these figures, the golf ball 81 has a diameter in the range larger than small (English size 4.1) and smaller than large (American size 4.3), and it weighs less than 1.6 ounces (46 g). These values are almost equal to a formal golf ball. The golf ball 81 has narrow holes 82 in three diametrical axes which cross orthogonally to one another at the core. Therefore, there are 6 openings of the narrow holes 82 on the surface of the golf ball 81.

The sphere of the golf ball 81 is made of an intermediate part 84 covered by a surface part 83, and the inner part to the intermediate part 84 is made hollow. The surface part 83 is made of the same hard plastics as a formal golf ball. The intermediate part 84 is made of a material such as rubber and soft plastics of larger gravity, and the narrow holes 82 are formed to taper off from the core 85 to the surface 83. The intermediate part above can comprise a plurality of layers.

In the above design, the air in the core 85 of the golf ball 81 is enclosed firmly keeping constant pressure against the air rapidly passing over the surface of the golf ball 81 during its flight by a full swing of a golf club (hereinafter referred to as high-pressure air). The hemi-sphere facing forward during the flight will include at least one hole of the 6 narrow holes 82 of the golf ball 81. Therefore, the difference of the pressure between the high-pressure air around the flying golf ball 81 and the air at the core of it causes the high-pressure air to flow into the golf ball 81 through the narrow holes 82. The golf ball 81 is filled with the high-pressure air flowed into it and compressed, and then the high-pressure air is blown out of the golf ball 81 through narrow holes 82 other than the holes that led in the high-pressure air. During this process of the high-pressure air flowing into the ball and blown out of it, the golf ball will lose its kinetic energy, thereby shortening its flight distance.

The above golf ball 81 can be carried with the touch to a formal golf ball by a full swing of a wood club on a teeing ground or an iron club on a fair way because the weight of the golf ball 81 is almost equal to a formal golf ball. However, its flight distance can be shortened by the composite of its intermediate part and the configuration of the narrow holes. The touch of the golf ball 81 and the

carrying distance by a putter on a green are similar to a formal golf ball.

The flight distance of a golf ball can be shortened by providing the surface of a ball with dimples in the appropriate form. That is, the ball comprises a sphere surface whereon a prescribed number of concaves are provided with an optional bottom shape. The bottom is surrounded by the side as extending from the surface of the ball. The profile of the dimple is formed of a trapezoid generally.

Figures 61 through 63 show an embodiment the above golf ball. The surface 87 of a golf ball 86 comprises a dimple 88 (concave part) having a plan view of a right circle of about 4 mm in diameter, and the bottom 89 of the dimple 88 is formed of a right circle of about 2.5 mm in diameter. The bottom 89 of the dimple 88 is formed of a plane or a curved plate having an equal curvature to the surface 82 of the golf ball 86. Between the outline of the dimple 88 along the surface and the bottom 89, a curve side 90 is built like a bowl. The curve side 90 can be formed of a plane or a curved plate. A plurality of the above dimples are provided over the surface of the golf ball. Figures 64 through 66 show other embodiments. In a dimple 93 having a hexagonal outline, two opposite sides are about 4 mm apart. The bottom shape (hereinafter referred to as the bottom 94) of the dimple 93 is also formed of a hexagon with two opposite sides about 2.5 mm apart. The bottom 94 of the dimple 94 is formed of a plane or a curved plate having an equal curvature of the surface 92 of the golf ball 91. Between the outline of the dimple 93 along the surface and the bottom 94, a curve side 95 is built like a bowl. This side 95 is formed with a plane or a curved plate.

A plurality of the above dimples 93 are formed over the surface of the golf ball.

The dimples 93 formed of concaves over the surface of the golf ball 91 can be formed of an octagon and other polygons as indicated in Figures 67 and 68.

Figures 69 through 71 show other embodiments of dimples. In these figures, a dimple 98 having a plan view outline of a right circle is formed in about 4 mm diameter. Both the top plane and the outline of the dimple 98 are formed of a right circle, with the top plane diameter formed in about 2.5 mm diameter.

The top plane 99 of the dimple 98 is formed of a plane or a curved plate having an equal curvature to the surface 97 of the golf ball 96.

Between the outline of the dimple 98 along the surface and the top plane 99, a cylindrical side 100 is built. The side plane 100 is formed with a plane or a curved plate.

In Figures 72 through 74, a dimple 103 having a hexagonal outline formed over the surface 102 of the golf ball 101 has two opposite sides about 4 mm apart, and the top plane shape (hereinafter referred to as top plane 104) is also formed of a hexagon, with two opposite sides of the top plane 104 about 2.5 mm apart. The top plane of the dimple 104 is formed of a plane or a curved plate having an equal curvature to the surface 102 of the golf ball 101. Between the outline of the dimple 103 along the surface and the top plane 104, six side planes 105 are built at the prescribed obliqueness.

In Figures 75 through 77, a dimple 108 having an octagonal outline formed over the surface 107 of the golf ball 106 is formed with two opposite sides about 4 mm apart, and the top plane shape (hereinafter referred to as top plane 109) is also formed of an octagon with two opposite sides of the top plane 109 about 2.5 mm apart. The top plane 109 of the dimple 108 is formed of a plane or a curve plate having an equal curvature of the surface 107 of the golf ball 106. Between the outline of the dimple 108 along the surface and the top plane 109, eight sides 110 are built at the prescribed obliqueness.

The plan view of the outline of the dimples 88, 93, 98, 103, and 108 can be of any polygon such as a triangle, pentagon, etc.

Each golf ball 86, 91, 96, 101, and 106 indicated in the above embodiments can be provided on its surface with a combination of dimples of concave and convex forms.

Dimples enlarge the surface of each of the above golf balls by their bottom and top planes, increasing the resistance of air and reducing the flight distance of a golf ball.

The above described dimples of the golf ball can be formed by the groove over the surface of a ball. A golf ball can be easily identified by modifying the groove pattern, and the pattern is not easily erased by wear-out.

A golf ball 111 shown in Figures 78 through 84 is a sphere of 41.15 - 42.67 mm in diameter and 44.50 - 45.92 g in weight. The golf ball 111 is made of soft rubber, plastics, foam polyurethane, etc. On the surface of this golf ball 111, curved groove pattern 112 is provided (hereinafter referred to as a pattern 112).

As shown in Figure 78 indicating the front view of the golf ball 111, the groove forming the pattern 112 curves counterclockwise along the circular outline of the golf ball 111, crosses around the center to right, then curves clockwise along the circular outline, thus drawing a letter S. In the plan view, the pattern 112 looks like a balloon swelling to right (>) (Figure 80). In the left side view, the pattern 112 shows three curves turning before the center of the circular outline of the ball at 60 degrees apart from

one another (Figure 82). In the back view, the pattern 112 is symmetry of itself in the front view (Figure 79). In the bottom view, the pattern 112 is symmetry of itself in the plan view (Figure 81).

The pattern 112 in the side and left views is symmetric on the basis of the central point of the circular outline of the ball (Figures 82 and 83).

The profile (Figure 84) of the golf ball along the line A-A of Figure 78 shows that the groove of the pattern 112 makes a concave on the surface of the golf ball 111. The golf ball 111 in the profile is made of a uniform material, but can be a combination of layers of a plastic surface part and a foam polyurethane core. Such a combination is designed to reduce the flight distance of the golf ball 111. This generates the synergistic effect with the air resistance caused by the groove of the pattern 112 to reduce the flight distance of the golf ball 111. Therefore, this golf ball 111 cannot be carried so far compared with an ordinary golf ball even when it is shot by a full swing with a golf club.

The pattern 114 of the golf ball 113 shown in Figures 85 through 91 looks like a numeric character 3 (Figure 85). Therefore, as shown in Figure 87, the pattern 114 in the plan view looks almost identical to the pattern 114 in the front view. In Figure 89, the pattern 114 in the left side view shows four arcs at the top, bottom, right, and left of the circular outline of the ball.

The profile in Figure 91 clearly shows two grooves of the pattern 114 each on the top, bottom, right, and left of the circular outline of the ball. As shown in Figure 86, the pattern 114 in the back view is symmetry of that in the front view, and the pattern 114 in the bottom view is symmetry of that of the plan view (Figure 88). The pattern 114 in the right side view is identical to the pattern 114 of the left side view when turned about 90 degrees right or left (Figures 89 and 90).

In Figures 92 through 98, the pattern 116 on the golf ball 115 show three lines waving from top to bottom. In the front view in Figure 92 the central part of the waving lines show convexes facing right. The waving parts up and down this central waving parts show convexes facing left. The pattern 116 in the plan view looks almost identical to the pattern 116 in the front view (Figure 94).

The pattern 116 in the left view shows a circle projecting outside at the up, down, right, and left parts (Figure 96). As shown in Figure 97, the pattern 116 in the right side view looks almost identical to the pattern 116 in the left side view when turned about 45 degrees in either direction. As shown in Figure 98, the profile shows concaves made by eight grooves along the circular outline of the golf ball.

As shown in Figures 99 through 105, the pattern 118 in the front view of the golf ball 117 is

formed like an alphabetical character S, and the pattern in the plan view shows a character U as turned 90 degrees counterclockwise around the center of the circular outline of the golf ball (Figures 99 and 101). The pattern 118 in the left side view shows three arcs of grooves at about 60 degrees apart from one another based on the center of the circular outline of the golf ball 117 (Figure 103). The pattern 118 in the back and bottom views shows symmetry of that in the front and plan views (Figures 100 and 102), and the pattern 118 in the right side view shows a 180 degree symmetry of that in the left side view on the basis of the central point (Figure 104). The pattern in the profile shown in Figure 105 shows 6 concaves of grooves along the circular outline of the golf ball.

The above described pattern can be designed optionally as long as the pattern of the golf ball can be identified from every direction. The flight distance of the golf ball can be adjusted by modifying the depth of the grooves.

Figures 106 through 113 show a golf ball made of soft rubber, soft plastics, foam polyurethane, or other materials, and formed of a sphere provided with concaves of grooves over its surface for reducing the flight distance of the ball.

The golf ball 119 shown in Figures 106 and 107 is provided with concave parts 120 comprising a number of patterned units aligned vertically and placed horizontally zigzag. The concave parts 120 are formed of an oval with its central portion along the longer side narrowed. Inside of the oval, the focus points are remained as remaining islands 121.

In Figure 106, the surface of the remaining islands 121 and the surface 122 of the golf ball 119 are shown as of equal level. However, The remaining islands 121 can be formed as island projections higher than the surface 122 of the golf ball 119. The golf ball 119 can be made of a single material of soft rubber, soft plastics, etc. as single layer structure, or made of double layer structure such as plastic surface part and foam synthetic resin core (for example, foam polyurethane). The depth of the concave parts 120 relative to the surface 122 of the golf ball 119 is set to the appropriate value for reducing the flight distance of the golf ball 119 when shot by a full swing with a golf club. The profile pattern of the concave parts 120 is formed of an arc, but can be of a cubic box or a mixed pattern of an arc and a cubic box for reducing the flight distance down to the appropriate value.

The golf ball 123 shown in Figures 108 and 109 has a number of rows of concave parts 124 both vertically and horizontally. The patterned unit of the concave parts 124 is of a cross turned 45 degrees. Inside of the concave parts 124, the remaining islands are not formed as shown in Figure

106, but remaining islands or island projections can be provided at the center of each patterned unit of the concave part 124. The concave parts 124 are formed shallower toward four ends 125, and the remaining islands 126 are formed of equal level.

The golf ball 127 shown in Figures 110 and 111 is provided with concave parts 128 comprising a number of patterned units placed horizontally zigzag and aligned vertically. The concave parts 128 are formed of a rectangle 128a, and a circular remaining island 129 or an island projection 130 is formed around the center of the concave part.

The golf ball 131 shown in Figures 112 and 113 is provided with a number of concaves 132 in lozenge patterns, and lozenge islands 133 remain as convex parts in the center of the concaves 132.

Thus, when the golf ball provided with the above described concave parts over the surface is shot by a full swing with a golf club, the concave parts resist the forward air, causing a larger resistance of the golf ball against the air and then reducing the flight distance of the golf ball.

A golf ball is usually identified by the number or the name of its owner printed on its surface, but the identification often cannot be recognized depending on the directional state of the ball.

Figures 114 through 133 show a golf ball which is provided on its surface with an identification pattern recognizable from every direction of the ball.

The golf ball 134 shown in Figures 114 and 115 is made of a single material such as elastic rubber or synthetic resin, or a combination of these materials. The diameter of the golf ball is 42.67 mm - 41.15 mm. Three circles 135 are printed at two opposite tops of the golf ball 134. The width of these circles 135 is 3 mm and the interval of each circle is set to 1 mm. Inside of the innermost circle 135, a dot 136 of about 4 mm diameter is printed at the center. This pattern is printed on two opposite tops of the golf ball 134 symmetrically on the basis of the central point. No patterns are printed on the side of the ball 134 between these opposite tops.

The golf ball 137 shown in Figures 116 and 117 has two opposite patterned-tops comprising 4 arcs 138 of 4 mm width around each center. Two same patterns are printed symmetrically on the basis of the center point and center line. In the front view of this golf ball, one interval of arcs of each pattern on top and bottom comes to the front. The convex parts of arcs of the top and bottom patterns are aligned. No patterns are printed on the side of the golf ball 137 between these opposite tops.

The golf ball 139 shown in Figures 118 and 119 has the same pattern on two opposite tops. The pattern comprises 4 arcs 140 of about 5 mm

formed like an alphabetical character S, and the pattern in the plan view shows a character U as turned 90 degrees counterclockwise around the center of the circular outline of the golf ball (Figures 99 and 101). The pattern 118 in the left side view shows three arcs of grooves at about 60 degrees apart from one another based on the center of the circular outline of the golf ball 117 (Figure 103). The pattern 118 in the back and bottom views shows symmetry of that in the front and plan views (Figures 100 and 102), and the pattern 118 in the right side view shows a 180 degree symmetry of that in the left side view on the basis of the central point (Figure 104). The pattern in the profile shown in Figure 105 shows 6 concaves of grooves along the circular outline of the golf ball.

The above described pattern can be designed optionally as long as the pattern of the golf ball can be identified from every direction. The flight distance of the golf ball can be adjusted by modifying the depth of the grooves.

Figures 106 through 113 show a golf ball made of soft rubber, soft plastics, foam polyurethane, or other materials, and formed of a sphere provided with concaves of grooves over its surface for reducing the flight distance of the ball.

The golf ball 119 shown in Figures 106 and 107 is provided with concave parts 120 comprising a number of patterned units aligned vertically and placed horizontally zigzag. The concave parts 120 are formed of an oval with its central portion along the longer side narrowed. Inside of the oval, the focus points are remained as remaining islands 121.

In Figure 106, the surface of the remaining islands 121 and the surface 122 of the golf ball 119 are shown as of equal level. However, The remaining islands 121 can be formed as island projections higher than the surface 122 of the golf ball 119. The golf ball 119 can be made of a single material of soft rubber, soft plastics, etc. as single layer structure, or made of double layer structure such as plastic surface part and foam synthetic resin core (for example, foam polyurethane). The depth of the concave parts 120 relative to the surface 122 of the golf ball 119 is set to the appropriate value for reducing the flight distance of the golf ball 119 when shot by a full swing with a golf club. The profile pattern of the concave parts 120 is formed of an arc, but can be of a cubic box or a mixed pattern of an arc and a cubic box for reducing the flight distance down to the appropriate value.

The golf ball 123 shown in Figures 108 and 109 has a number of rows of concave parts 124 both vertically and horizontally. The patterned unit of the concave parts 124 is of a cross turned 45 degrees. Inside of the concave parts 124, the remaining islands are not formed as shown in Figure

106, but remaining islands or island projections can be provided at the center of each patterned unit of the concave part 124. The concave parts 124 are formed shallower toward four ends 125, and the remaining islands 126 are formed of equal level.

The golf ball 127 shown in Figures 110 and 111 is provided with concave parts 128 comprising a number of patterned units placed horizontally zigzag and aligned vertically. The concave parts 128 are formed of a rectangle 128a, and a circular remaining island 129 or an island projection 130 is formed around the center of the concave part.

The golf ball 131 shown in Figures 112 and 113 is provided with a number of concaves 132 in lozenge patterns, and lozenge islands 133 remain as convex parts in the center of the concaves 132.

Thus, when the golf ball provided with the above described concave parts over the surface is shot by a full swing with a golf club, the concave parts resist the forward air, causing a larger resistance of the golf ball against the air and then reducing the flight distance of the golf ball.

A golf ball is usually identified by the number or the name of its owner printed on its surface, but the identification often cannot be recognized depending on the directional state of the ball.

Figures 114 through 133 show a golf ball which is provided on its surface with an identification pattern recognizable from every direction of the ball.

The golf ball 134 shown in Figures 114 and 115 is made of a single material such as elastic rubber or synthetic resin, or a combination of these materials. The diameter of the golf ball is 42.67 mm - 41.15 mm. Three circles 135 are printed at two opposite tops of the golf ball 134. The width of these circles 135 is 3 mm and the interval of each circle is set to 1 mm. Inside of the innermost circle 135, a dot 136 of about 4 mm diameter is printed at the center. This pattern is printed on two opposite tops of the golf ball 134 symmetrically on the basis of the central point. No patterns are printed on the side of the ball 134 between these opposite tops.

The golf ball 137 shown in Figures 116 and 117 has two opposite patterned-tops comprising 4 arcs 138 of 4 mm width around each center. Two same patterns are printed symmetrically on the basis of the center point and center line. In the front view of this golf ball, one interval of arcs of each pattern on top and bottom comes to the front. The convex parts of arcs of the top and bottom patterns are aligned. No patterns are printed on the side of the golf ball 137 between these opposite tops.

The golf ball 139 shown in Figures 118 and 119 has the same pattern on two opposite tops. The pattern comprises 4 arcs 140 of about 5 mm

gravity than the material of said intermediate part.

4. The miniature golf links according to claim 3, wherein:
said intermediate part is made of a light foam material.

5. The miniature golf links according to claim 3, wherein:
said golf ball has average gravity of less than 1.

10. 6. The miniature golf links according to claim 1, wherein:
said golf ball has three narrow holes that cross orthogonally from one another and penetrate said ball from one point of the surface to another point. The wall of said hole is tapered from the central part of said ball to its surface.

15. 7. The miniature golf links according to claim 1, wherein:
said golf ball has a spherical surface, and said surface has a plurality of concaves having an optional outline of its bottom. Between said concave bottom and said surface, the side portion of said concave is built in a profile of trapezoid.

20. 8. The miniature golf links according to claim 1, wherein:
said golf ball has a spherical surface, and said surface has a plurality of convexes having an optional outline of top surface. Between said convex top and said spherical surface, the side portion of said convex is built in a profile of trapezoid.

25. 9. The miniature golf links according to claim 7, wherein:
said golf ball has a spherical surface, and said surface has a plurality of convexes having an optional outline of top surface. Between said convex top and said spherical surface, the side portion of said convex is built in a profile of trapezoid.

30. 10. The miniature golf links according to claim 1, wherein:
said golf ball is made of soft rubber, soft plastics, foam polyurethane, or other materials and formed of a sphere. The surface of said sphere is provided with optional form of concaves to reduce the flight distance of said golf ball.

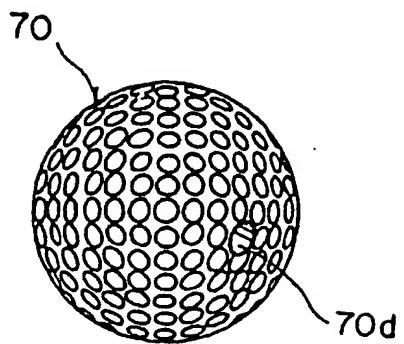
35. 40. 45. 50. 55.

11. The miniature golf links according to claim 10, wherein:
said golf ball has a plastic surface and foam synthetic resin core.

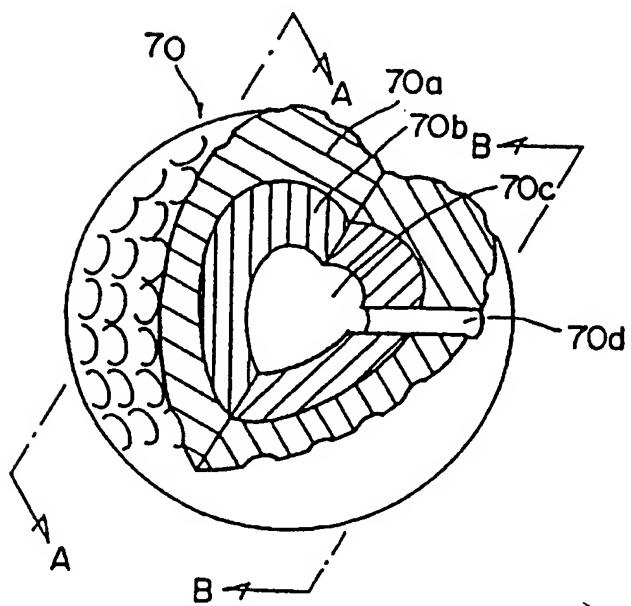
12. The miniature golf links according to claim 10, wherein:
said golf ball has concaves of a pattern of grooves over the surface.

13. The miniature golf links according to claim 10, wherein:
said golf ball has at least one small hole to set a ball on a projection on a tee.

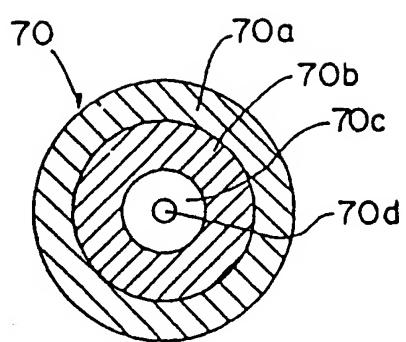
14. The miniature golf ball according to claim 10, wherein:
said golf ball has an optional graphic pattern over the surface to identify said golf ball from every direction.



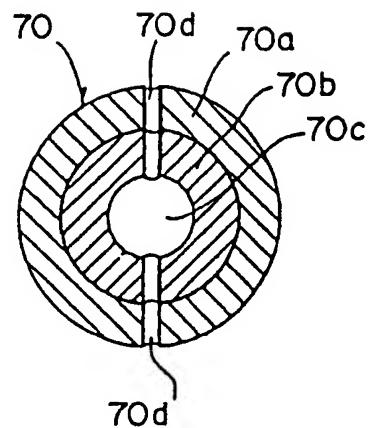
F i g . 4 5



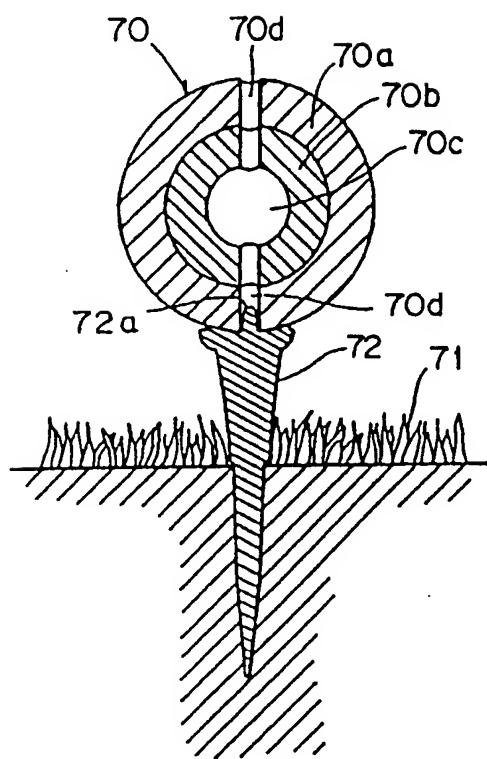
F i g . 4 6



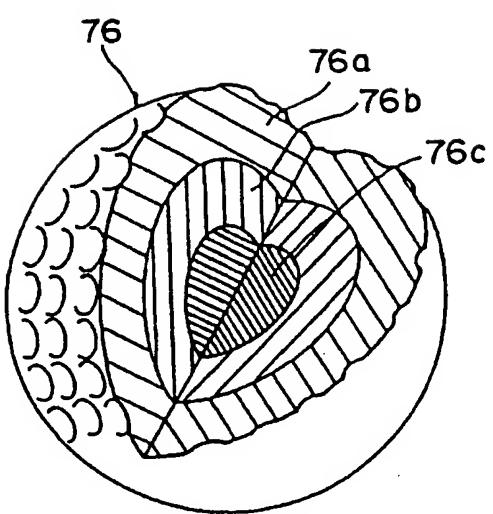
F i g . 4 7



F i g . 4 8



F i g . 4 9



F i g . 5 2

Fig. 54

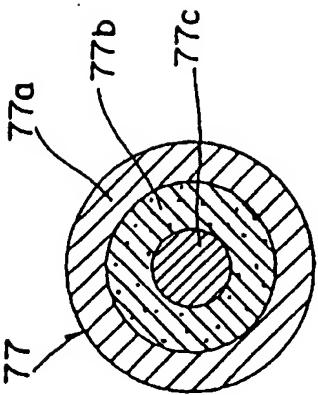
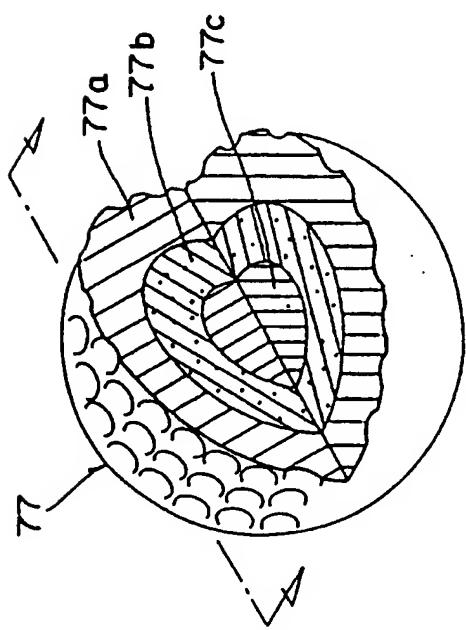
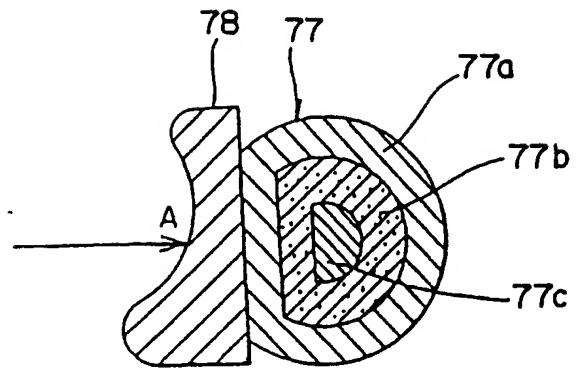
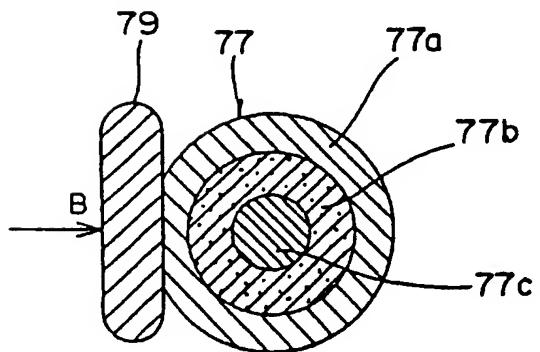


Fig. 53

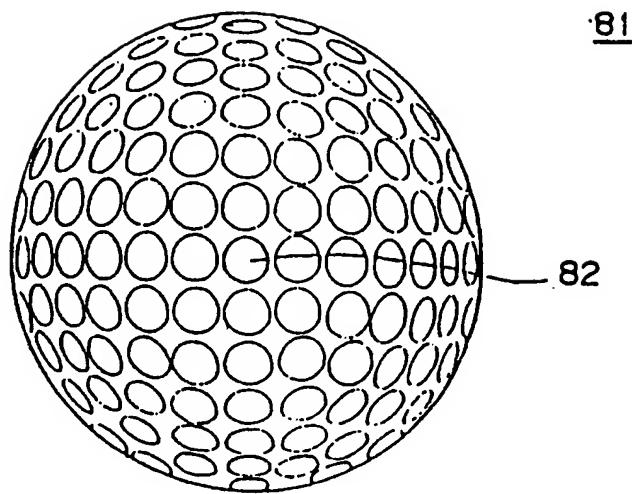




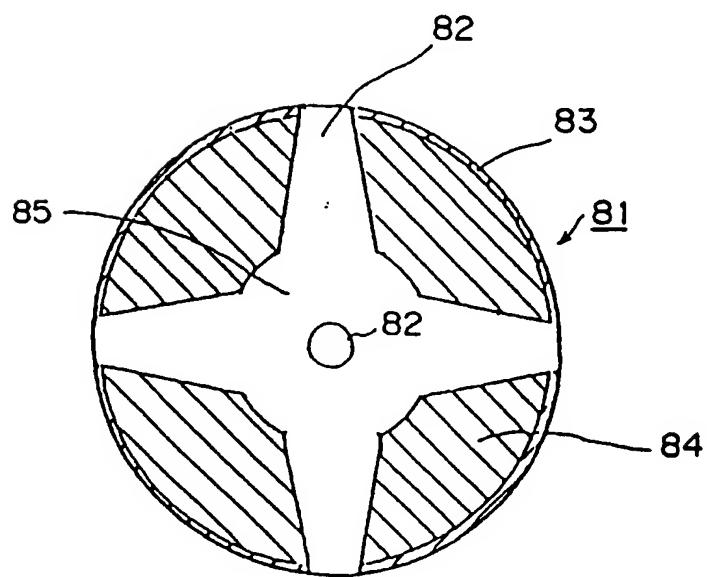
F i g . 5 6



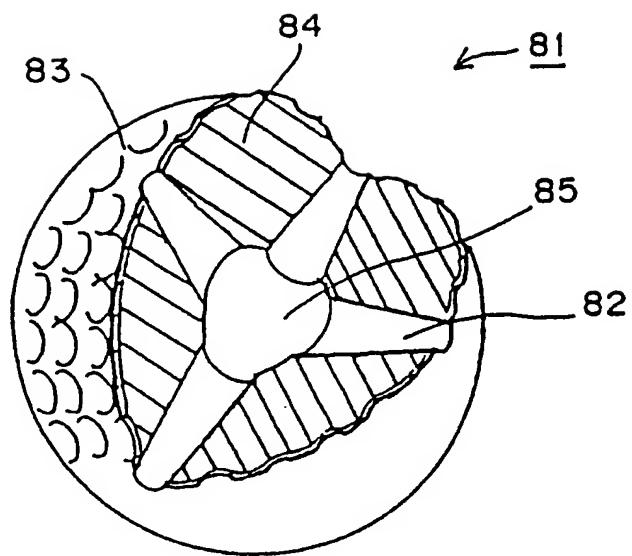
F i g . 5 7



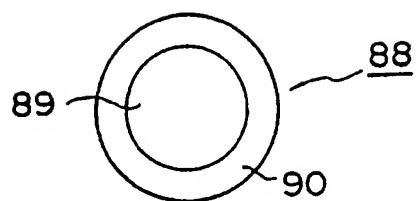
F i g . 5 8



F i g . 5 9



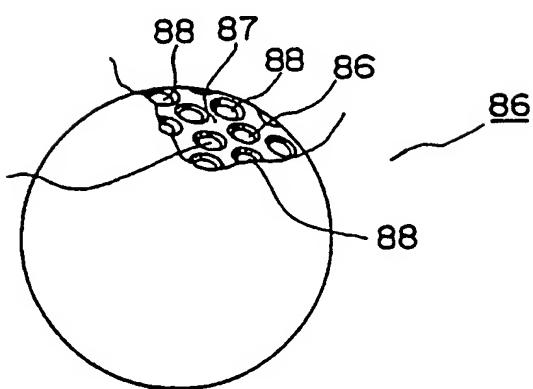
F i g . 6 0



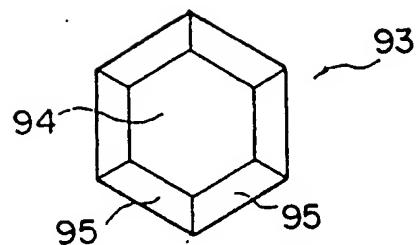
F i g . 6 2



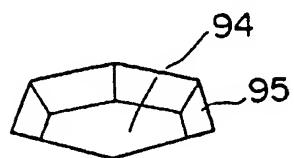
F i g . 6 3



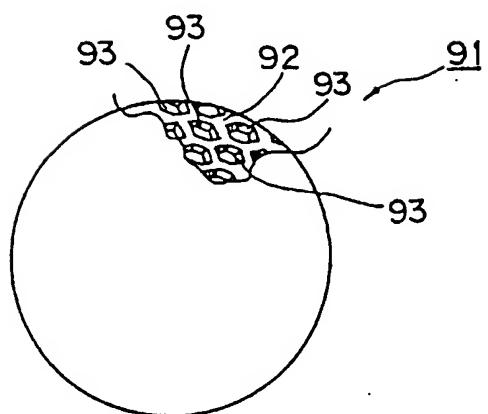
F i g . 6 1



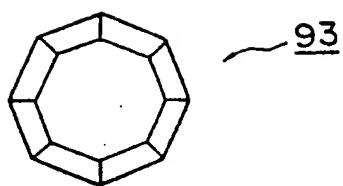
F i g . 6 5



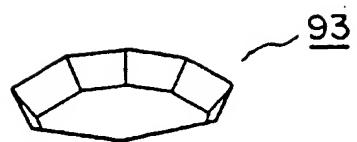
F i g . 6 6



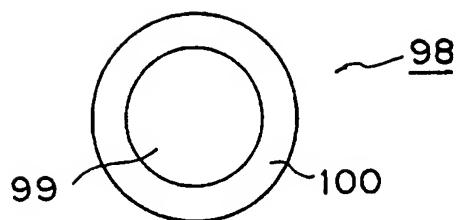
F i g . 6 4



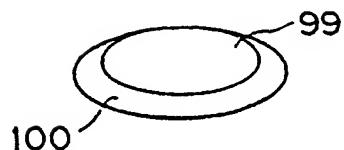
F i g . 6 7



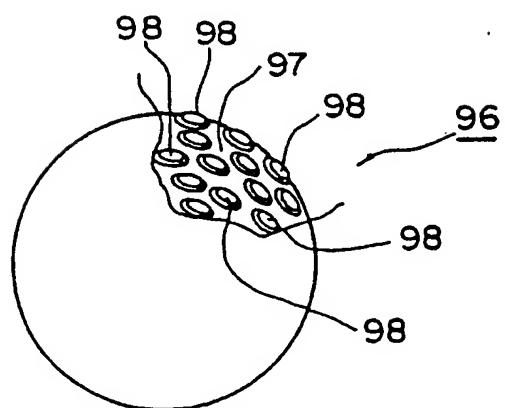
F i g . 6 8



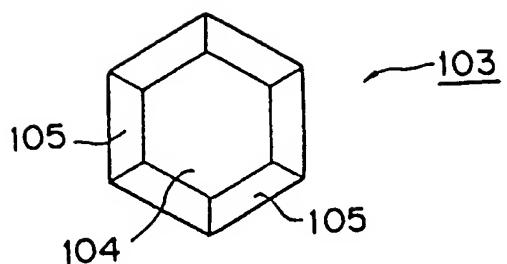
F i g . 7 0



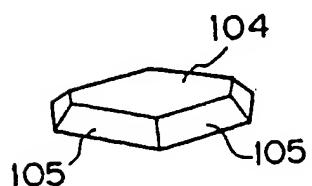
F i g . 7 1



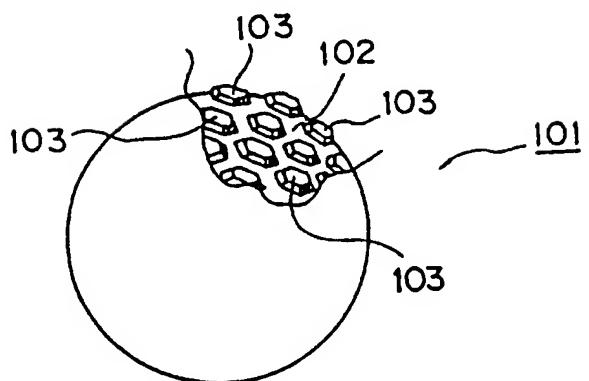
F i g . 6 9



F i g . 7 3



F i g . 7 4



F i g . 7 2

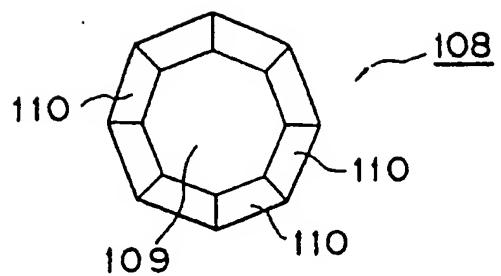


Fig. 76

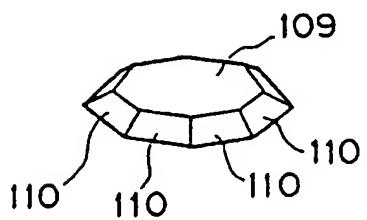


Fig. 77

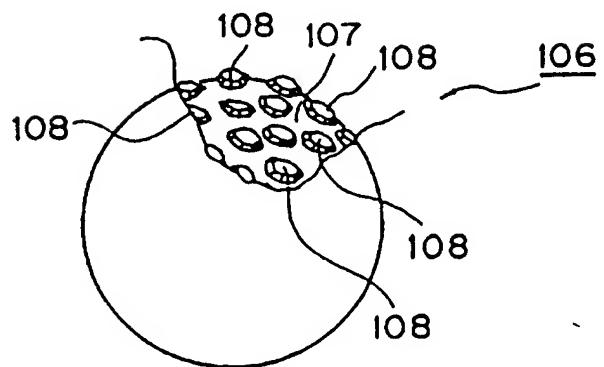


Fig. 75

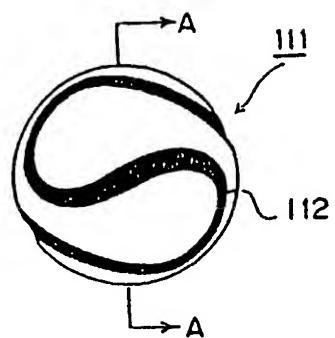


Fig. 78

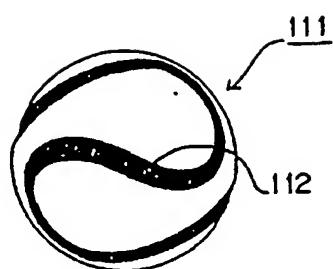


Fig. 79

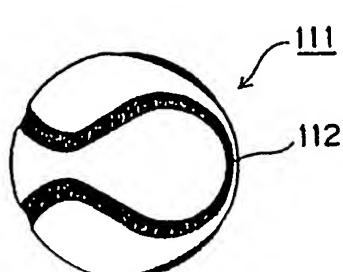


Fig. 80

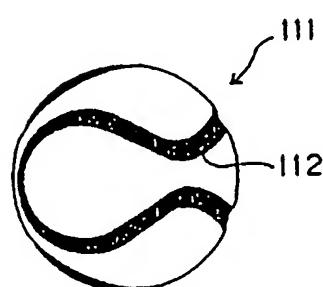


Fig. 81

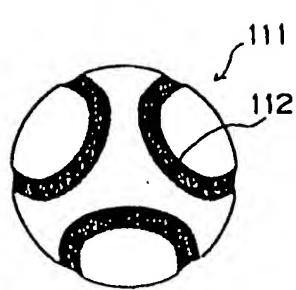


Fig. 82

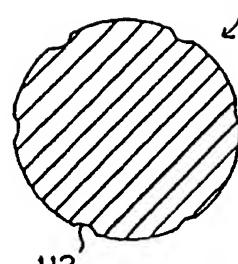


Fig. 84

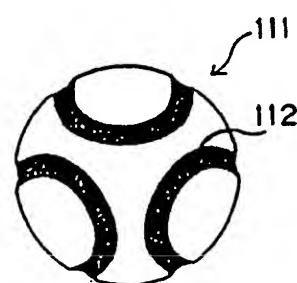


Fig. 83

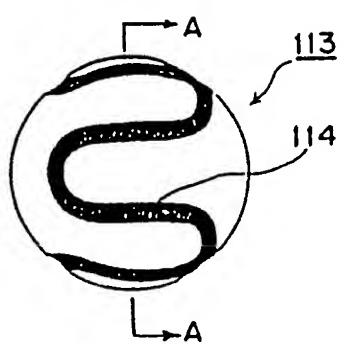


Fig. 85

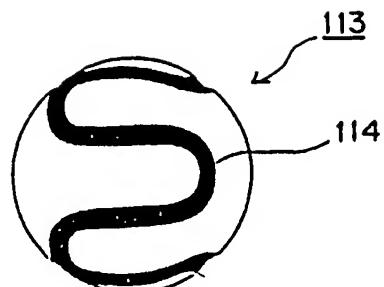


Fig. 86

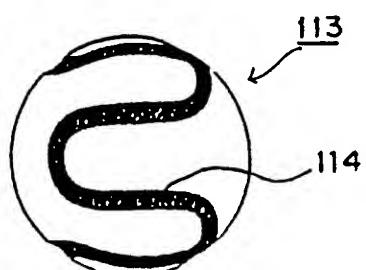


Fig. 87

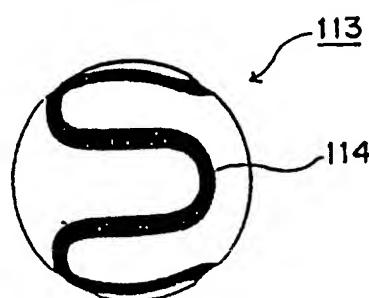


Fig. 88

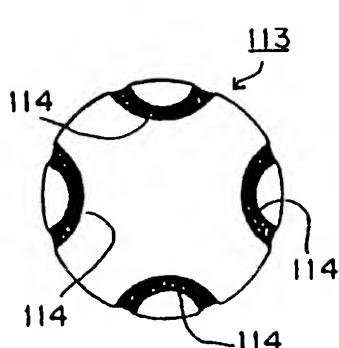


Fig. 89

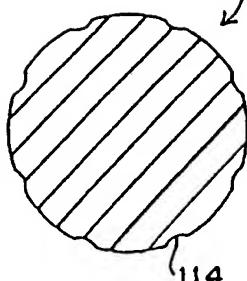


Fig. 91

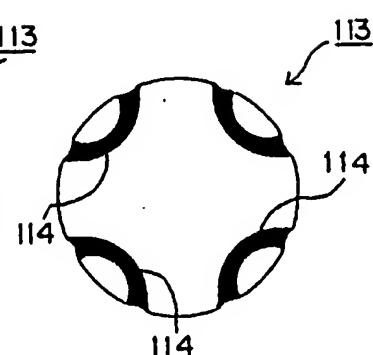


Fig. 90

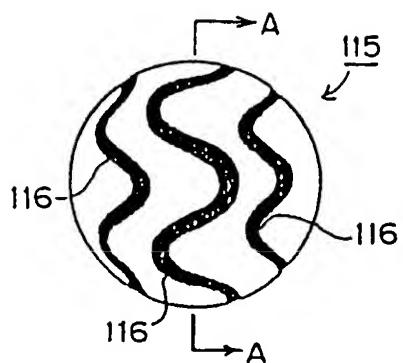


Fig. 9 2

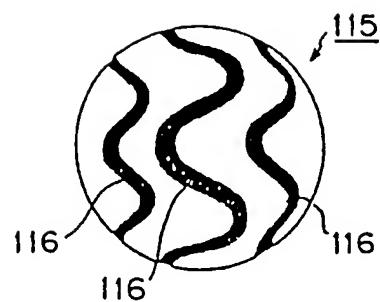


Fig. 9 3

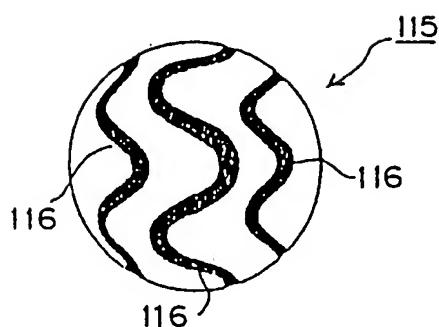


Fig. 9 4

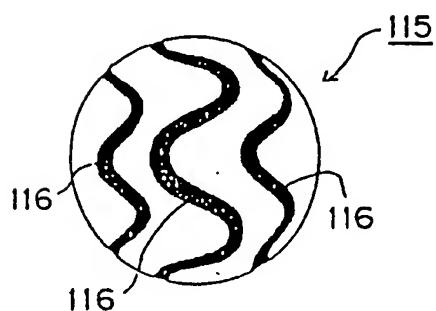


Fig. 9 5

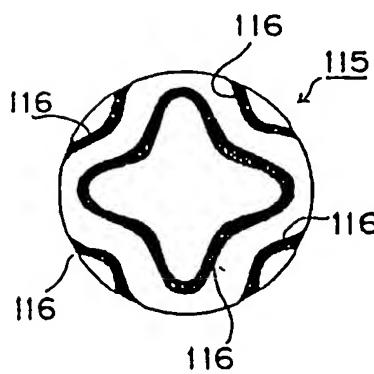


Fig. 9 6

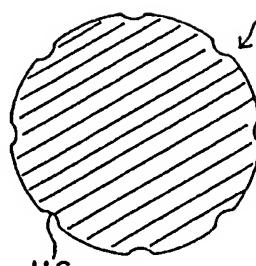


Fig. 9 8

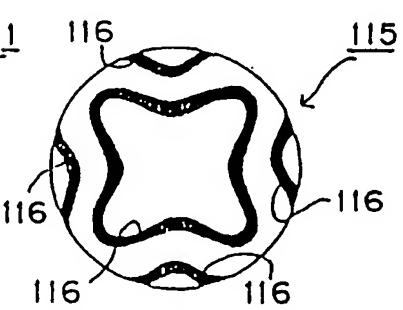


Fig. 9 7

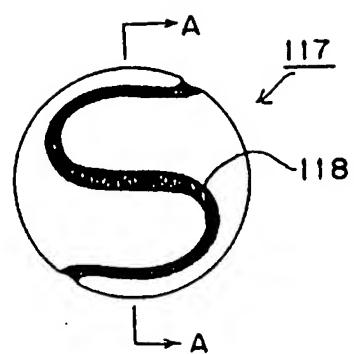


Fig. 99

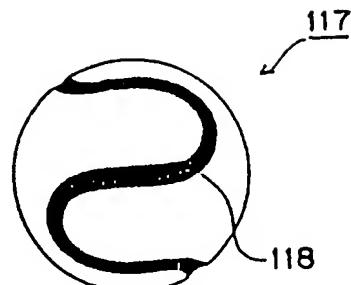


Fig. 100

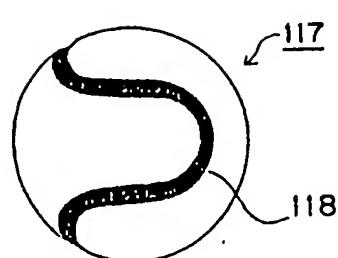


Fig. 101

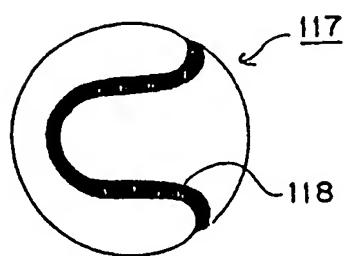


Fig. 102

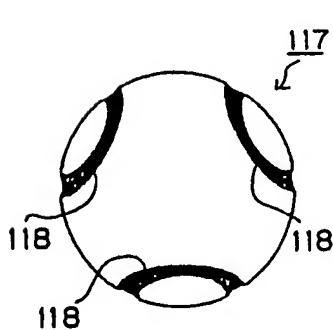


Fig. 103

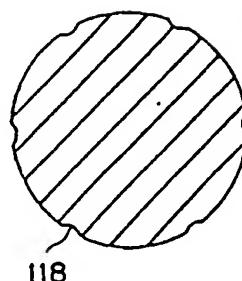


Fig. 105

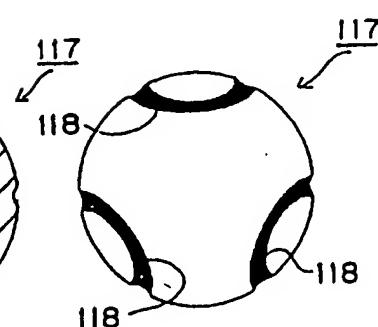


Fig. 104

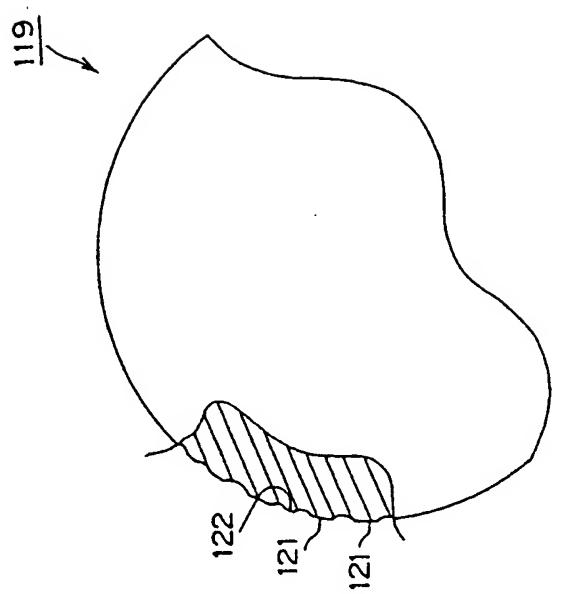


Fig. 107

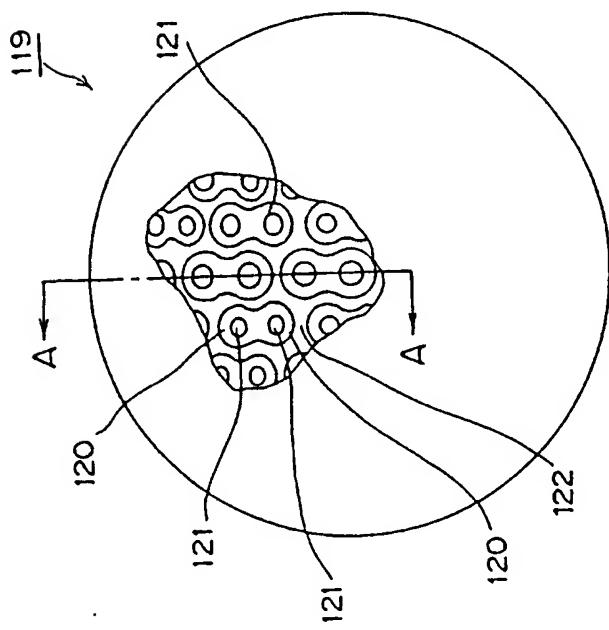


Fig. 106

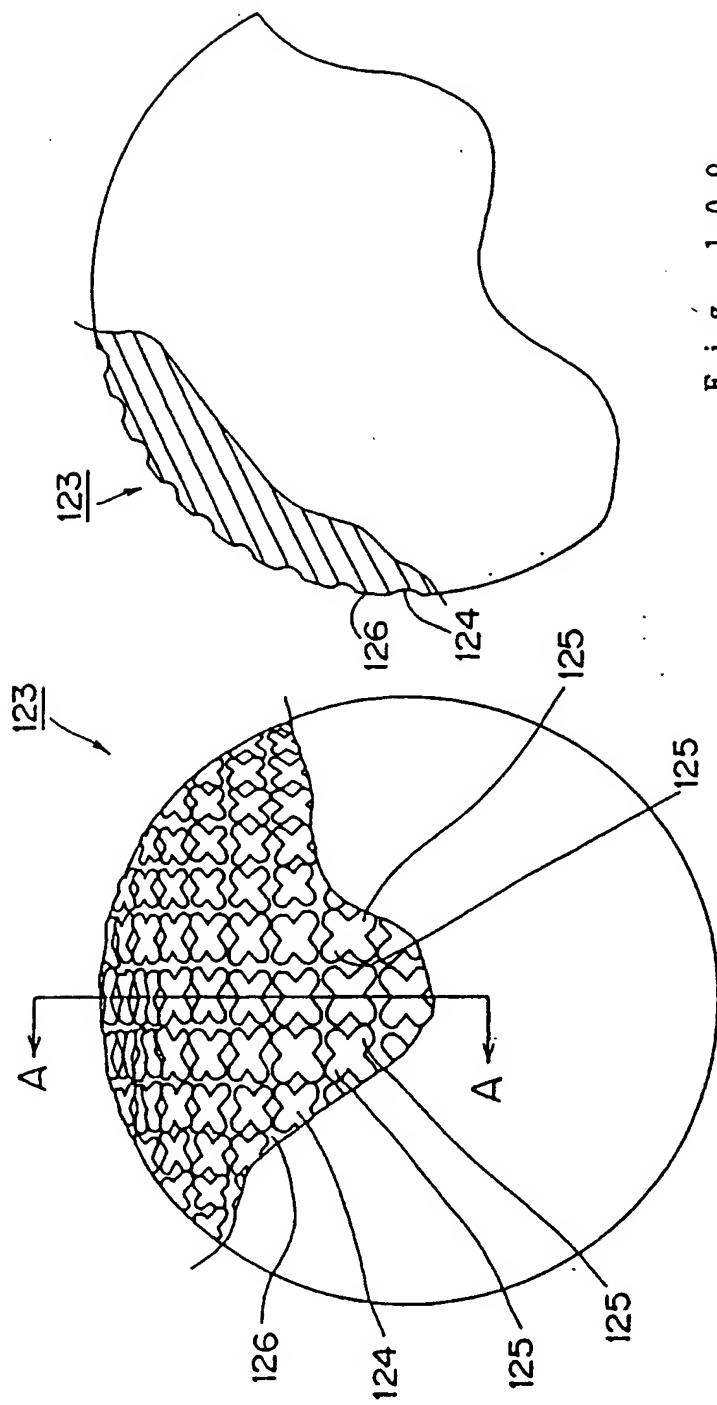


Fig. 109

Fig. 108

Fig. 111

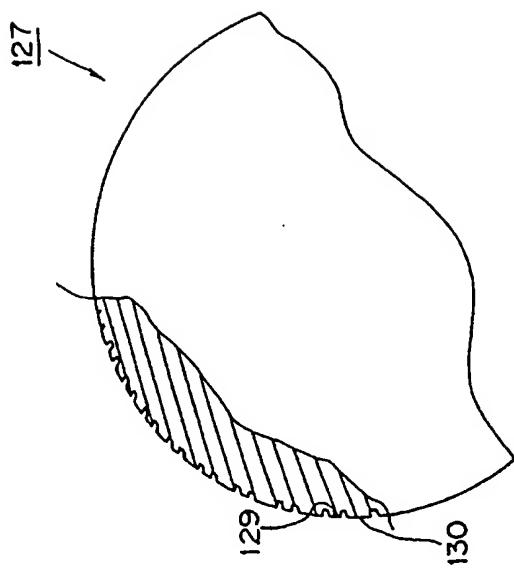
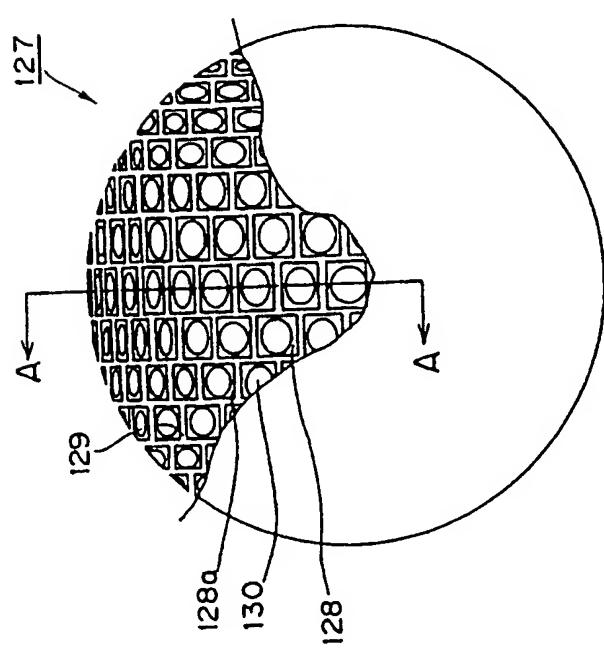


Fig. 110



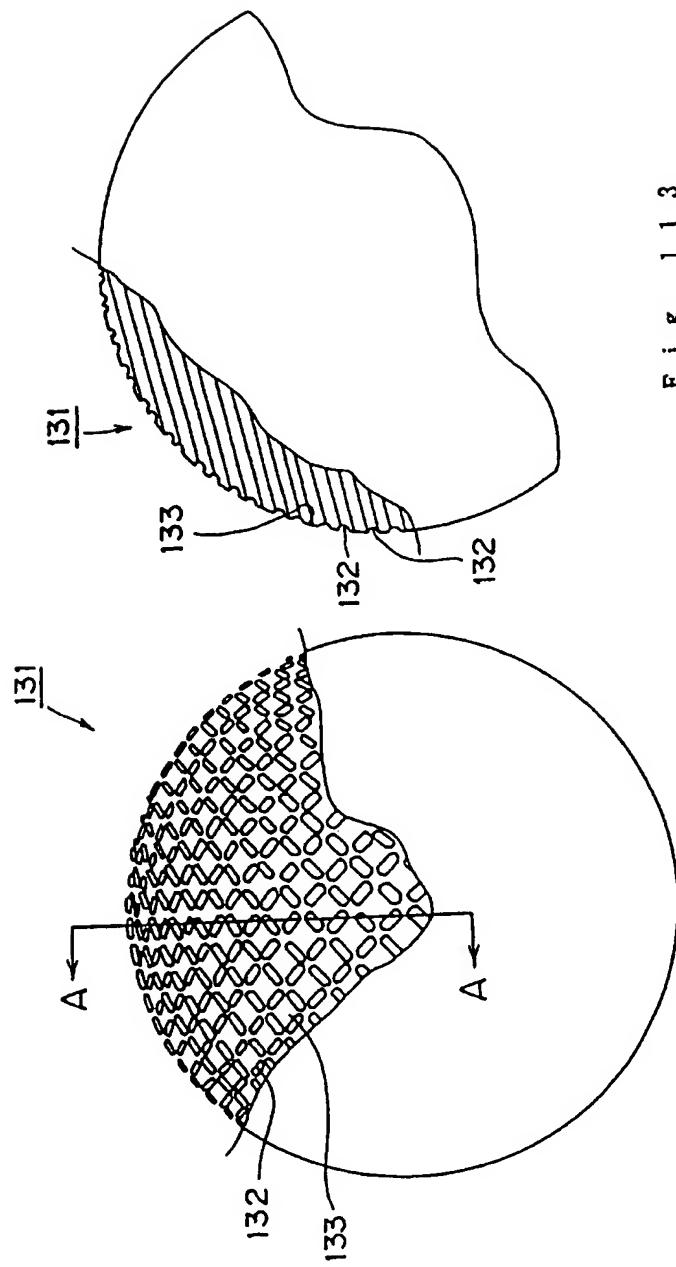


Fig. 113

Fig. 112

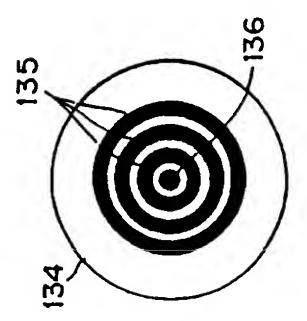


Fig. 114

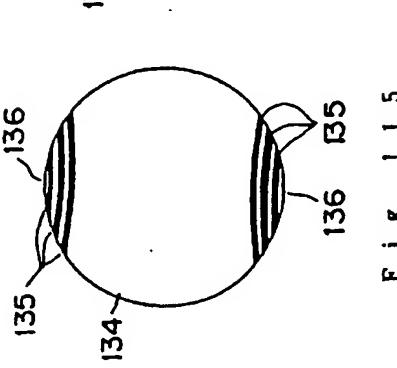


Fig. 115

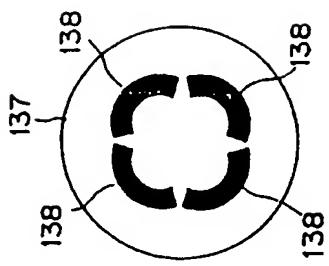


Fig. 116

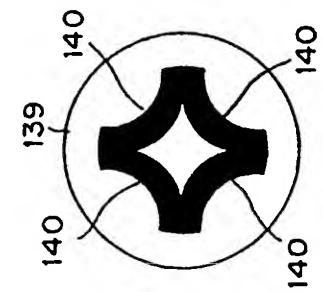


Fig. 118

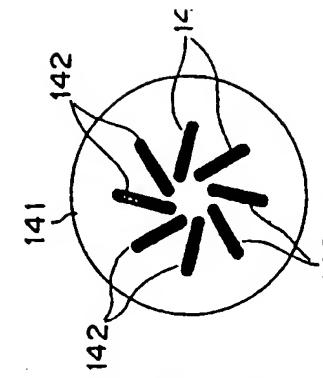


Fig. 120

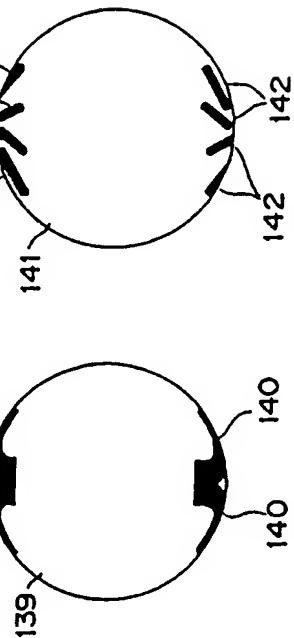


Fig. 121

Fig. 119

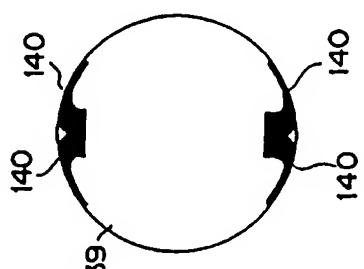


Fig. 120

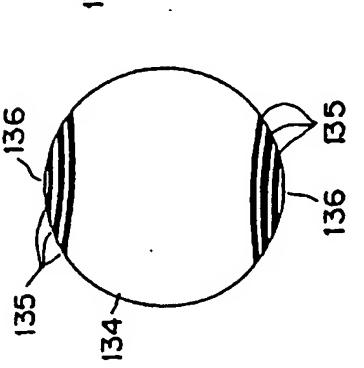


Fig. 117

Fig. 120

Fig. 121

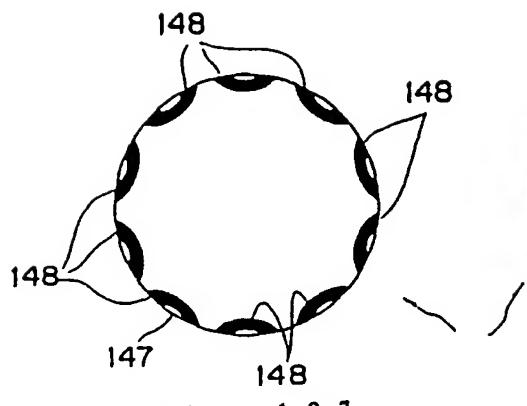


Fig. 127

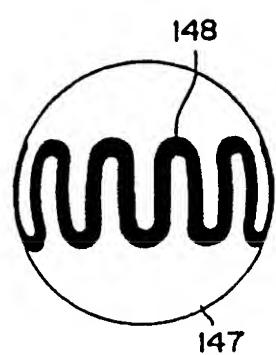


Fig. 126

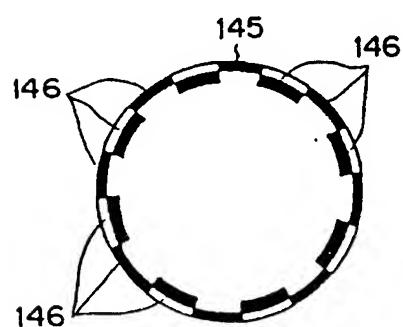


Fig. 125

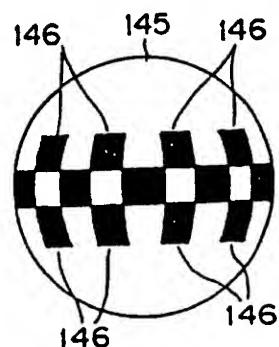


Fig. 124

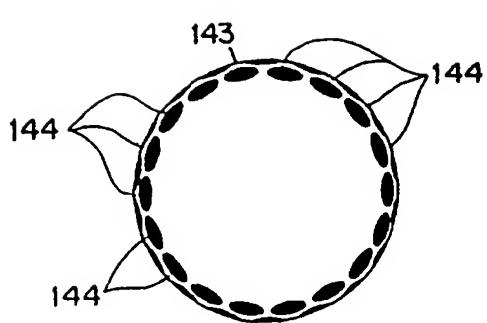


Fig. 123

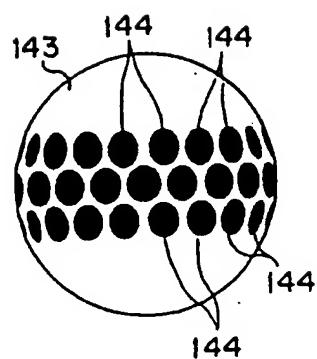


Fig. 122

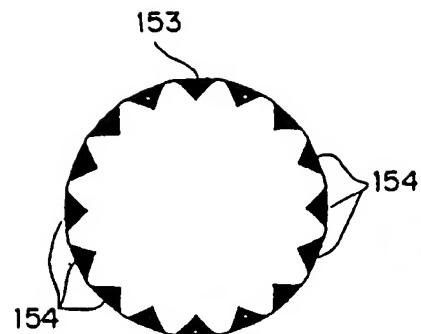


Fig. 133

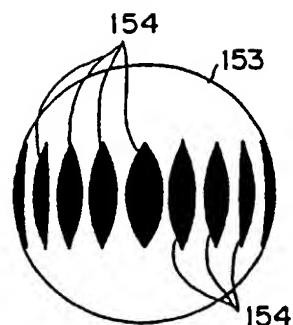


Fig. 132

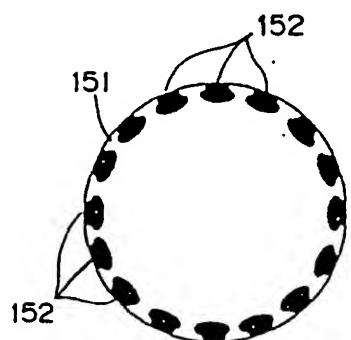


Fig. 131

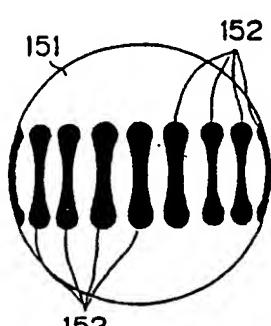


Fig. 130

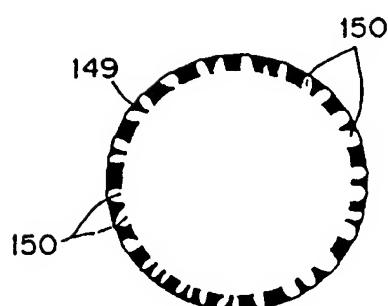


Fig. 129

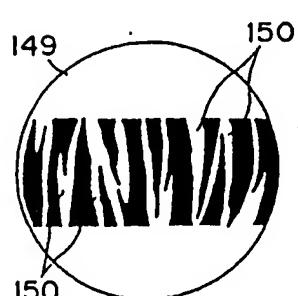


Fig. 128



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 10 9375

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.)
X	EP-A-0 154 735 (MACGREGOR GOLF COMPANY)	3,4,10, 11	A63B37/00
Y	* page 2, line 24 - line 32; figures *	5,7,12, 14	
	* page 4, line 26 - page 5, line 11 *	---	
Y	WO-A-88 00486 (WARRICK ET AL.)	5	
A	* claims 1-7; figure 2 *	1,2	
Y	US-A-4 830 378 (AOYAMA) * column 4, line 27 - line 51; figures 5,7 *	7	

Y	GB-A-420 410 (BURBANK) * figures *	12	

Y	EP-A-0 220 317 (ARIMA) * abstract *	14	

A	EP-A-0 264 522 (WILSON SPORTING GOODS COMPANY) * abstract *	1,2	

A	US-A-4 150 826 (BALDOROSSI ET AL.) * abstract; figures 3,5,5A *	1-5	A63B

X	EP-A-0 186 933 (MACGREGOR GOLF COMPANY) * abstract; claims 1,2; figure *	3,4,10, 11	

The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		12 September 1995	Jones, T
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons -----			
& : member of the same patent family, corresponding document			